

Serial No. PCT/CA03/00333
Prel. Amendt.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A photosensitive material ~~characterized by comprising~~ at least one organic species in an organic-inorganic matrix, the ~~organic~~ at least one organic species comprising a material having a refractive index which changes upon exposure to actinic radiation.
2. (Currently amended) A photosensitive material according to claim 1, characterized in that wherein the organic species comprises one or more of efficient organic photosensitive and photoinitiating species together with a monomer or a mixture of monomers.
3. (Currently amended) A photosensitive material according to claim 1 ~~or 2~~, characterized in that wherein the organic-inorganic matrix comprises an organically modified glassy host with the organic species dispersed therein and/or chemically-bonded thereto.
4. (Currently amended) A photosensitive material according to claim 3, characterized in that wherein the organic species is bonded to the organic-inorganic matrix by covalent bonding.
5. (Currently amended) A photosensitive material according to claim 3, characterized in that wherein the organic species comprises a dispersion in the organic-inorganic material.
6. (Currently amended) A photosensitive material according to claim 1, characterized in that wherein the at least one organic species is entrapped as a guest within the organic-inorganic host matrix.
7. (Currently amended) A photosensitive material according to ~~any one of claims 1 to 6~~ claim 1, characterized in that wherein the photosensitive material comprises a product of a sol-gel process.
8. (Currently amended) A photosensitive material according to ~~any of claims 1 to 7~~ claim 1, characterized in that wherein the organic species is selected from the group comprising halogen-substituted acetophenones, chromophore-substituted triazines, azo dyes, benzoin ethers, ketals, o-acylated oximino ketones, acyl phosphine oxides, aromatic ketones, hexaarylbisimidazoles, bis(p-dialkylaminobenzilidene)ketones, thioxanthenes, ketocoumarins,

Serial No. PCT/CA03/00333
Prel. Amendt.

9-phenylacridine, dye-sensitized systems such as xantene, acridinium, phenazine and thiazine dyes in combination with activators such as amines, sulfinates, enolates, carboxylates and organotin compounds, dye-borate complexes, ferrocenium salts, aluminate complexes, protic acid generators such as sulfonium or iodonium salts capable of initiating cationic polymerization, and organometallic systems such as dicyclopentadienyltitanocenes, in particular bis(pentafluorophenyl)titanocene, titanocene/N-phenylglycine, and bis(μ^2 -2,4-cyclopentadien-1-yl)-bis-[2,6-difluoro-3-(1H-pyrrol-1-yl)phenyl]titanium; and bis(p-dialkylaminobenzilidene) ketones in combination with a hexaarylbisimidazole initiating system with charge transfer agents such as 2-mercaptobenzoxazole.

9. (Currently amended) A photosensitive material according to ~~any of claims 1 to 7~~ claim 1, characterized in that wherein the organic species is selected from the monomers capable of free radical or cationic polymerization, respectively.

10. (Currently amended) A photosensitive material according to claim 9, characterized in that wherein the monomers are ethylenically unsaturated monomers capable of free radical addition polymerization.

11. (Currently amended) A photosensitive material according to claim 10, characterized in that wherein the monomers are acrylate or methacrylate monomers with high propagation and low termination rates.

12. (Currently amended) A photosensitive material according to claim 10, characterized in that wherein the monomers are either liquid monomers, or solid monomers or a combination of one or more solid monomers and one or more liquid monomers.

13. (Currently amended) A photosensitive material according to claim 10, ~~11 or 12,~~ characterized in that wherein the monomers are selected from the group comprising phenyl acrylate, 2-phenoxyethyl acrylate, N-vinylcarbazol, 3,6-dibromo-9-vinyl carbazol, p-chlorophenyl acrylate, hexanediol diacrylate, vinyl benzoate, tert-butyl hydroperoxide, hexanediol diacrylate, 2,4,6-tribromophenyl acrylate, phenyl acrylate, orthobiphenyl acrylate, orthobiphenyl methacrylate, di(2-acryloxyethyl) ether of bisphenol-A, 2-phenylethyl acrylate, di-(p-chlorophenoxy)ethyl acrylate, and pentachlorophenyl acrylate.

14. (Currently amended) A photosensitive material according to claim 10, characterized in

Serial No. PCT/CA03/00333
Prel. Amendr.

that wherein the monomers are selected from the group comprising multifunctional monomers containing two or more ethylenically unsaturated groups.

15. (Currently amended) A photosensitive material according to claim 14, ~~characterized in that wherein~~ the monomers are selected from the group consisting of ethylene glycol diacrylate, diethylen glycol diacrylate, 1,4-butanediol diacrylate, decamethylene glycon diacrylate, 1,4-cyclohexanediol diacrylate, glycerol diacrylate, glycerol triacrylate, ethylene glycol dimethacrylate, butylene glycol dimethacrylate, tripropylene glycol diacrylate, di(2-acryloxyethyl) ether of bisphenol-A, di(2-acryloxyethyl) ether of tetrabromo-bisphenol-A.

16. (Currently amended) A photosensitive material according to claim 10 ~~or 12~~, ~~characterized in that wherein~~ the monomers are those capable of cationic ring opening polymerization (CROP).

17. (Currently amended) A photosensitive material according to claim 16, ~~characterized in that wherein~~ the monomers have two or more cyclohexene oxide groups linked through siloxane chain segments, for example 1,3-bis[2-(3{7-oxabicyclo[4.1.0]heptyl})ethyl]-tetramethyl disiloxane.

18. (Currently amended) A material according to ~~any one of claims 1 to 17~~, claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix comprises a material synthesized using organo alkoxysilanes as one or more of the precursors for a sol-gel reaction in which organic groups are introduced within an inorganic network through the $\equiv Si-C-$ bond.

19. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the matrix material comprises, in the presence of dispersed photosensitive, photoinitiating and photopolymerizable species, copolymerized epoxysilanes and either or both of a tetraalkoxysilane and a trialkoxysilane.

20. (Currently amended) A material according to claim 19, ~~characterized in that wherein~~ the epoxysilane is a (3-glycidoxypropyl) trialkoxysilane.

Serial No. PCT/CA03/00333
Prel. Amend.

21. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix comprises functionalized oligomers or polymers co-condensated with metal alkoxides in which chemical bonding is between inorganic and organic parts.

22. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix material comprises an inorganic species within a polymer matrix.

23. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix comprises an inorganic species, generally in the form of particles with a characteristic size of a few hundred angstroms, generated *in situ* within a polymer.

24. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix material comprises either previously formed oxide gels infiltrated by polymerizable organic monomers or polymers mixed with metal alkoxides in a common solvent.

25. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix material comprises porous oxide gels impregnated with organics and polymerized *in situ* using thermal or irradiation processes.

26. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the material comprises an oxide network formed by condensation of metal alkoxide in the presence of polymers.

Serial No. PCT/CA03/00333
Prel. Amendt.

27. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix comprises a material formed by impregnating or entrapping organic material as a guest within the inorganic host matrix.

28 (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix comprises a material formed by interpenetrating networks and simultaneous formation of inorganic and organic phases. .

29. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix comprises a material formed as an organic network within an inorganic network by either photochemical or thermal curing thereof using triethoxysilane $R'Si(OR)_3$ or diethoxysilanes $R'R''Si(OR)_2$ as the precursor with R' and R'' being a polymerizable group such as an epoxy group.

30. (Currently amended) A material according to ~~any one of claims 1 to 17~~ claim 1, ~~characterized in that wherein~~ the organic-inorganic matrix comprises a material formed as inorganic/organic simultaneous interpenetrating networks, where both inorganic glass and polymer formation occur concurrently.

31. (Currently amended) A material according to claim 30, ~~characterized in that wherein~~ the organic-inorganic matrix comprises a material synthesized through a synchronous application of the aqueous ring-opening metathesis polymerization of cyclic alkenyl monomers and the hydrolysis and condensation of metal alkoxides.

32. (Currently amended) A process of making a photosensitive material ~~characterized by comprising~~ the steps of forming an organic-inorganic matrix containing at least one organic species having a refractive index that changes on exposure to actinic radiation.

Serial No. PCT/CA03/00333
Prel. Amend.

In the specification, page 1 has been amended to include the claim to priority from Provisional patent application No. 60/363,038.

With a view to avoiding excess claims fees, the claims have been amended to remove multiple dependencies. In addition, some typographical errors have been corrected.

No new subject matter has been added by the foregoing amendments.

Serial No. PCT/CA03/00333
Pre1. Amend.

33. (Currently amended) A process according to claim 32, characterized in that wherein the process comprises a sol-gel process.
34. (Currently amended) A process according to claim 32, characterized in that wherein the organic-inorganic matrix is synthesized using organo alkoxysilanes as one or more of the precursors for a sol-gel reaction in which organic groups are introduced within an inorganic network through the =Si-C-bond .
35. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the matrix material is formed by copolymerization of epoxysilanes and either or both of a tetraalkoxysilane and a trialkoxysilane in the presence of dispersed photosensitive, photoinitiating and photopolymerizable species.
36. (Currently amended) A process according to claim 35, characterized in that wherein the epoxysilane used is a (3-glycidoxypropyl) trialkoxysilane.
37. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the organic-inorganic matrix is formed by means of a co-condensation of functionalized oligomers or polymers with metal alkoxides in which chemical bonding is established between inorganic and organic phases.
38. (Currently amended) A process according to claim 32, characterized in that wherein the organic-inorganic matrix material is synthesized through the formation of inorganic species within a polymer matrix.

Serial No. PCT/CA03/00333
Prel. Amendt.

39. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the inorganic species, generally in the form of particles with a characteristic size of a few hundred angstroms, are generated *in situ* within polymers by first swelling cross-linked, ionomeric, or crystalline polymeric host with a compatible solution containing metal alkoxides followed by the promotion of the sol-gel reaction of the inorganics.
40. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the organic-inorganic matrix material is obtained by either the infiltration of previously formed oxide gels with polymerizable organic monomers or the mixing of polymers with metal alkoxides in a common solvent.
41. (Currently amended) A process according to claim 32, characterized in that wherein the organic-inorganic matrix material is formed by impregnation of porous oxide gels with organics followed by an *in situ* polymerization initiated by thermal or irradiation processes.
42. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the hydrolysis and condensation of metal alkoxide are carried out in the presence of polymers and organic-inorganic matrix material is formed by trapping polymers within the oxide gel network.
43. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the organic-inorganic matrix material is formed by interpenetrating networks and simultaneous formation of inorganic and organic phases.
44. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the organic-inorganic matrix material is formed as an organic network within the inorganic network by either photochemical or thermal curing of such groups using triethoxysilane

Serial No. PCT/CA03/00333
Prel. Amend.

$R'Si(OR)_3$ or diethoxysilanes $R'R''Si(OR)_2$ as the precursor with R' and R'' being a polymerizable group such as an epoxy group.

45. (Currently amended) A process according to claim 32 or 33, characterized in that wherein the organic-inorganic matrix material is formed as inorganic-organic simultaneous interpenetrating networks, where both inorganic glass and polymer formation occur concurrently.

46. (Currently amended) A process according to claim 32 or 33, characterized in that wherein said material is synthesized through a synchronous application of the aqueous ring-opening metathesis polymerization of cyclic alkenyl monomers and the hydrolysis and condensation of metal alkoxides.

47. (Currently amended) A process according to claim 32 or 33, characterized by comprising the step of employing polymerizable monomers as the cosolvents such that all the components contribute either to the inorganic network or to the organic polymer.

48. (Currently amended) A body of photosensitive material characterized by comprising at least one organic species in an organic-inorganic matrix, the ~~organic~~ at least one organic species comprising a material having a refractive index which changes upon exposure to actinic radiation, and other organic species comprise one or more efficient organic photosensitive and photoinitiating species together with a monomer or a mixture of monomers, the body having at least one volume hologram formed therein.

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☒ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.